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Development of pocketbook based on higher order thinking skills of heat and transfer material for fifth grade students

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ABSTRACT

This study aims to assist students in understanding learning materials in science subjects by developing a pocketbook. A pocketbook is a small book that can be stored in a pocket and easy to carry everywhere. This practicality can help students to gain knowledge anywhere and anytime by using a pocketbook. So, the need for innovation and habituation, the researchers develop practical teaching materials that students can learn anywhere and adapting to the demands of the times, namely pocketbook based on high order thinking skills (HOTS) of heat and transfer materials for fifth graders of elementary school. It is expected that students will be able to develop creative thinking skills, high-level thinking and be able to solve problems in their daily lives by using students' thinking skills. The display of colorful pocketbooks, lots of pictures, unique layouts, and clear language makes students have new learning experiences without losing the essence/meaning of the material. The development model used is ADDIE (Analysis, Design, Development, Implementation and Evaluation). Data collection techniques, using product validation questionnaires by educational technology, material experts, and linguists experts, teacher response questionnaires and student response questionnaires. The results obtained from the development of HOTS-based pocketbook teaching materials are very valid. Besides, the teacher and students have positive response toward the developed pocketbook. This research is expected to help teachers in developing students' high-level and creative thinking skills, as well as being a reference in developing HOTS-based pocketbooks in the future.

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INTRODUCTION

In the Preamble to the 1945 Constitution there are 4 national goals of the Indonesian state, one of which is to educate the life of the nation. In Law (UU) No. 20 of 2003 concerning the National Education System, what is meant by education is being aware and planned to create

a learning atmosphere and learning process so that students actively develop their potential to have the power of self-control, self-control, intelligence, noble character, and the skills they need, society, nation and state. According to Ki Hajar Dewantara (in Neolaka and Grace, 2017:11) education is an effort to advance children's character, mind, and body, in order to increase the perfection of life, namely living and reviving children in harmony with nature and society.

At school, students experience the learning process. Learning is the process of seeing, observing and understanding something with a change in behavior, from not knowing to knowing, from being unskilled to being skilled (Fathurrohman, 2017:5-8). Books are one of the most widely used sources of teaching materials by schools and students. Most of these books have too few colors, pictures, and too many materials, making it difficult to carry anywhere (Yulmi, 2018:2). For this reason, there needs to be changes and innovations in developing teaching materials, not only in terms of appearance but also in terms of content, where the things that are loaded must be able to increase the curiosity of students, make students able to connect the material with everyday life, and make students to think more critically. One of the teaching materials that can be developed is a pocketbook.

The definition of a pocketbook in the Big Indonesian Dictionary is a small book that can be stored in a pocket and easy to carry everywhere. Pocketbooks contain concise and clear material. According to Cahyono (2018: 188) a pocketbook is a book that resembles a module, with a small size, can be stored in a pocket, and easy to carry everywhere so that it can be studied at any time. The pocketbook itself has a small size and only contains the core of the subject matter. According to Ariyantika, et al (2019:176) pocketbooks or Pocketbooks are one of the learning media that are generally often used to overcome the problem of the low interest of students in bringing books to school. According to Tena (2016:41) pocketbooks have several characteristics, including: (1) a pocketbook measuring 10 x 13 cm and can be stored in a pocket, (2) the contents of a pocketbook must be short, solid, clear and light, (3) easy to carry everywhere, and (4) thin pocketbook.

The pocketbook in its preparation was adapted from the module, so that the researchers followed the systematics of writing the module and adapted it to the needs of the HOTS-based pocketbook, as follows:

1) Introduction section (preface, table of contents, instructions for use, KD and Learning Objectives
2) Contents Section (ateri packaged in a compact, lightweight and HOTS-based)
3) Supporting Section (conclusion, glossary, bibliography)

The design of the HOTS-based pocketbook that the researcher will design is as follows:

1) Book Size and Material
    a. Pocketbook using laser paper, with a size of 7 1/2 cm x 10 cm.
    b. Pocketbooks are made not too thick.
2) Book Cover

Composition of bright and attractive colors, given attractive images according to the heat material and its transfer.

Natural Sciences (IPA) is one of the learning materials taught at the elementary school level which is taught from grade 1 to grade 6 SD. When talking about science material, students must have scientific characteristics, namely having high curiosity, being

objective, honest, thorough, independent, willing to work and cooperate, as well as receiving and giving, open-minded and critical and diligent and not give up easily (Susilowarno, et al, 2016:10). One of the study materials in Natural Sciences (IPA) is heat and its transfer, is a 5th grade elementary school material which is located on theme 6 (heat and its transfer), discussing what is meant by temperature and heat, how heat is transferred in everyday life, and the influence of heat in human life. The material of heat and its transfer is material that uses direct practice in its learning. The researcher chose this material to be included in a pocketbook because in the pocketbook the researcher included experiments that could be practiced directly by students, so that the concept of heat and its transfer material that required direct practice in learning could be fulfilled properly.

According to Dinni (2018:170) in the 21st century, education must be able to develop the abilities and skills of students to solve problems in everyday life, for that teachers can apply learning based on HOTS (High Order Thinking Skill). According to Karsono (2017: 52), HOTS is a skill in solving life problems. Higher order thinking skills should be instilled in students from an early age. HOTS-based learning not only requires students to memorize the material, but also invites students to be directly involved in creative problem solving. The Ministry of Education and Culture (in Fanani, 2018: 63-68) in detail describes the characteristics of HOTS questions as follows: (1) complex, (2) multiple solutions (having many solutions), (3) involving variations in decision making and interpretation, (4) applies multiple criteria (many criteria), (5) is effortful (requires a lot of effort).

Teachers have a responsibility to facilitate this and must find ways so that the demands of progress in the industrial era 4.0, namely having high-level thinking skills can be achieved. Based on this description, the researcher is interested in conducting a study entitled "Development of a Pocketbook Based on High Order Thinking Skills (HOTS) on Hot Materials and Transfers for Class V Elementary School".

METHOD

The development model used in this research is Research and Development using the ADDIE model. According to Sugiono (2019: 752-753), Research and Development is a research method used to produce a certain product, and test the effectiveness of the product. R&D also serves to validate and develop a product. Meanwhile, Sukmadinata (2013: 164) states that research and development is a process or steps to develop a new product or improve an existing product that can be accounted for. The ADDIE approach consists of the stages of analysis, design, development, implementation, and evaluation. This type of product development data is qualitative and quantitative data. Qualitative data was obtained from suggestions given by expert validators and teachers and students, while quantitative data in the form of assessment scores given by validators, teachers and students based on instruments in the form of validity sheets, teacher responses and student responses which were then processed according to the assessment criteria determined. has been determined to obtain validity, teacher responses and student responses.

The product validation process aims to determine the appropriateness of the appearance of the pocketbook, the feasibility of the content (material), and the feasibility of the language contained in the teaching materials to be used in elementary schools. The teacher response sheets and student responses were used to determine the feasibility of the developed pocketbook. The data analysis technique used is descriptive qualitative analysis

and descriptive quantitative analysis. Qualitative descriptive analysis aims to manage data in the form of suggestions given by expert validators, teachers and students who are used by researchers to revise the developed product, and quantitative descriptive analysis is used to analyze the scores obtained from the validation sheet and the practicality of the product can be seen in the table 1.

Table 1. Categories of the validity and feasibility of *LKPD*

Criteria	Kategori
81 - 100	Very Valid/Very Feasible
61 – 80	Valid/Feasible
41 – 60	Less Valid/Less Feasible
0 – 40	Not Valid/ Not Feasible

RESULTS AND DISCUSSION

This study aims to develop a pocketbook product based on High Order Thinking Skill (HOTS) on heat and transfer materials for fifth grade elementary school students with the ADDIE approach, that is:

a. Analysis

This stage is related to curriculum analysis and analysis of student needs so that products that can be developed can be found. The curriculum that applies at SDN 192 Pekanbaru is the 2013 curriculum which is in line with the current curriculum in Indonesia, namely the 2013 curriculum (K-13). Suyanto (in Arifin 2016:20) states that the 2013 curriculum uses learning in thematic form, which emphasizes the involvement of students in the active learning process in the learning process, so that students can gain direct experience and are trained to be able to find the various knowledge they learn. . According to PMPK RI Number 65 of 2013 states that in applying the 2013 curriculum learning process in schools, it must be carried out in a fun, interactive, challenging, inspiring way, motivating students to participate actively, independently according to their talents, interests, creativity, and development. physical and psychological learners.

The developed pocketbook has an illustrated, colorful display, contains a summary/core material, and is modern because it is equipped with a barcode that can be accessed by students to view learning videos to improve understanding of the material. The pocketbook product contains only Heat and Transfer materials with KD: 3.6 applying the concept of heat transfer in daily life and 4.6 reporting observations on heat transfer.

The use of books has an important role in the teaching and learning process. Pocketbooks are one of the teaching materials that can be used to make it easier for students to learn learning materials (Fajar, 2018: 29-30). Pocketbooks have different characteristics from other teaching materials, which are seen based on the size of the book and the practicality of its use (Primesstianissa, 2016:26). Therefore, researchers have developed a pocketbook that can make the learning process practical not only for teachers, but also for students.

Analysis Stage Evaluation

Evaluation is carried out at each stage in the development of a pocketbook based on high order thinking skills. The heat and transfer material is packaged in thematic form (combined with other subject matter) but the heat and transfer material in theme 6 cannot be separated from the basic concepts it has, so that the basic concepts of heat and its transfer material can still be conveyed properly. The material presented in the pocketbook develops all the science materials in theme 6 because they are interrelated with each other, so the material contained in the pocketbook is developed as a whole (one theme), but is still limited to science material only (caloric).

b. Design

After the analysis, the steps taken at the design stage are:

1) Collecting hot material and its transfer.
2) Create research instruments (expert validation instruments, teacher response instruments, 5 one-to-one questions and student response instruments).
3) Create a design framework. HOTS based pocketbook design made using Canva. At this stage the researcher designs the parts of the pocketbook, starting from the cover design and the contents of the pocketbook.

Design Stage Evaluation

At the design evaluation stage, the pocketbook section needs to be separated between sub-theme 1, sub-theme 2, and sub-theme 3 to make it clearer. A summary of the material is added so that students can repeat the material that has been obtained during reading and studying pocketbooks. Then the glossary as a guide for students to be able to know the terms in the pocketbook that may only be known by students.

c. Development

The development of the pocketbook was made using the Canva application, starting from the cover, contents, and HOTS-based questions.

Contents of HOTS-Based Pocketbooks

1. Cover

Supono (2015:2) states that the cover must have a value of beauty and the ability to sell, so that when consumers see the book, the intention arises to want to see, read and buy it. Cover is usually used as a visual language of a book that describes and expresses the contents of a book (Figure 1).

Figure 1. HOTS-Based Pocketbook Cover

2. Title Page

The title page is a page that contains the title of the pocketbook, authors, editors and supervisors, which can be seen in Figure 2 below:

Figure 2. Pocketbook Title Page

3. Opening Page

The opening page of the pocketbook contains the introduction, table of contents, instructions for use, basic competencies and learning objectives, which can be seen in Figure 3.

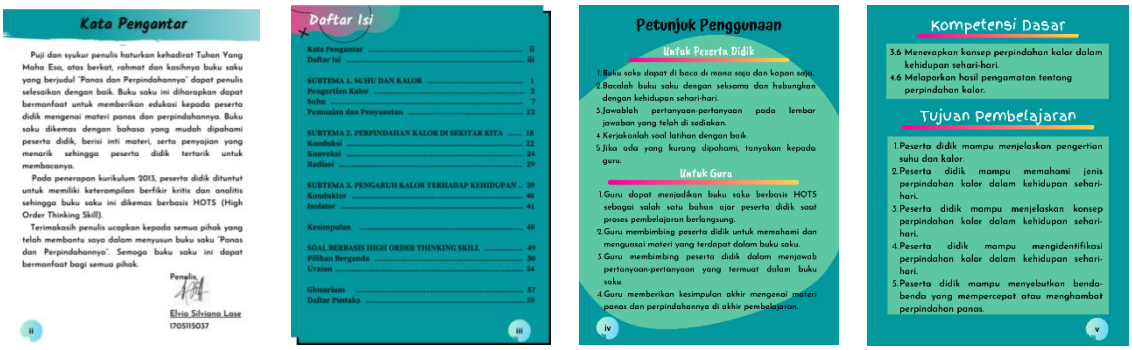

Figure 3. Opening Page

4. Contents of HOTS-Based Pocketbooks

The contents of the HOTS-based pocketbook contain material from heat and its transfer which are packaged into 3 major subthemes. In addition, the pocketbook contains reflections, insights, several HOTS-based questions packaged in the form of stories, conclusions, HOTS-based evaluation questions, and a glossary. The material presented in this HOTS-based pocketbook refers to the 2013 curriculum syllabus, by looking at the indicators of Heat and Transfer material, the material is compiled in the form of a summary of the material or the core of the material, so that students can easily understand the material. The questions are arranged based on HOTS to hone students' higher-order thinking skills. The entire contents of the pocketbook are made colorful and illustrated, as can be seen in Figure 4.

Figure 4. Contents of HOTS-Based Pocketbooks

5. Closing Page

The closing page contains conclusions, glossary and bibliography, which can be seen in Figure 5.

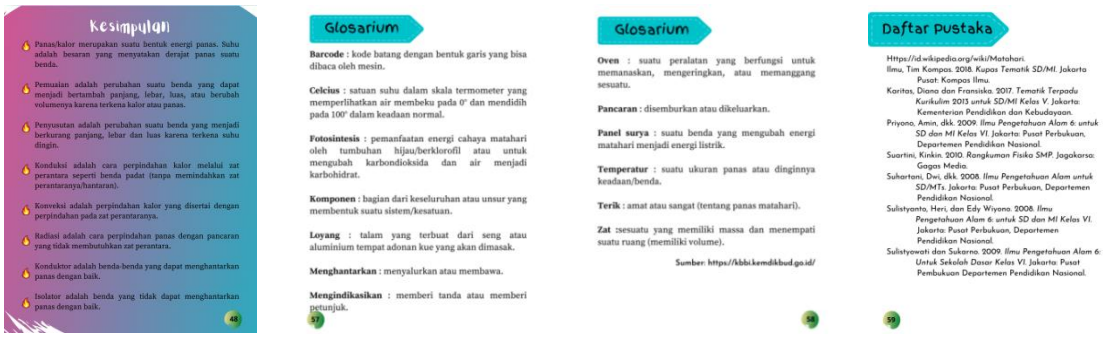

Figure 5. Development of Closing Pages

After the pocketbook has been developed and becomes a complete product, the pocketbook will then be tested for feasibility/validity. Researchers will conduct a validity test, by providing validator response sheets to educational technology experts, material experts, linguists in order to improve product development. Based on the results of the validation of educational technology experts, the average score of the assessment is 94.83% which belongs to the very valid category, which can be seen in table 2.

Table 2. Validation Results of Educational Technology Experts

No	Indicator	Score	Category
1.	Contents	97.22%	Very Valid
2.	Presentation	100%	Very Valid
3.	Language	83.33%	Very Valid
Average		**94.83%**	**Very Valid**

Based on the results of material expert validation, the average assessment score is 94.74% which is included in the very valid category, it can be seen in table 3.

Table 3. Material Expert Validation Results

No	Indicator	Score	Category
1.	Contents	95.83%	Very Valid
2.	Presentation and Language	89.28%	Very Valid
3.	Relevant to HOTS	100%	Very Valid
Average		**94.74%**	**Very Valid**

Based on the validation results from linguists, the average score of the assessment is 91.67% which belongs to the very valid category, which can be seen in table 4.

Table 4. Material Expert Validation Results

No	Indicator	Score	Category
1.	Language according to the level of development of students.	100%	Very Valid
2.	Communicative and interactive	100%	Very Valid
3.	Language according to formal Indonesai	75%	Valid
Average		**91.67%**	**Very Valid**

Development Stage Evaluation

HOTS-based pocketbook adapted to revisions from validators and teachers. Each input and revision from the validator and teacher is then corrected so that it is in accordance with the direction of the validator and teacher.

d. Implementation

At the implementation stage, the valid and appropriate books were then printed to see the teacher's response and the responses of the fifth-grade students of SDN 192 Pekanbaru.

Student Response (One To One)

One-on-one trials were carried out individually to 2 fifth grade students at SDN 192 Pekanbaru. This one to one stage was observed directly by the researcher. At this stage, interviews were conducted with students regarding the developed HOTS-based pocketbook. In this one-to-one activity, it was found that students felt happy using the HOTS-based pocketbook that was developed. The HOTS-based pocketbook that was developed has an attractive, colorful appearance and the material contained can be understood by students

because it contains a summary of the material. The pictures, colors, and brief explanations in this pocketbook make students enthusiastic in using it, and they don't find it difficult. In addition, students become well acquainted with heat material and its transfer. HOTS-based questions make students trained to be able to solve problems that exist around students intelligently and creatively.

It can be concluded that the product developed can be accepted by students as a pocketbook teaching material based on High Order Thinking Skill (HOTS) heat and transfer materials. HOTS-based pocketbook teaching materials can be used independently by students by reading anywhere and anytime because the pocketbook size is small and practical to use and easy to carry everywhere.

Teacher's Response

The teacher's response was carried out on four fifth grade elementary school teachers to see the teacher's response to the HOTS-based pocketbook that the researcher developed. Based on the results of the teacher's response, the average score of the assessment is 90.18%, it can be seen in table 5.

Table 5. Recapitulation of Teacher Response

No	Indicator	Score	Category
1.	Contents	87.50%	Very Valid
2.	Presentation	90.17%	Very Valid
3.	Language	92.18%	Very Valid
	Average	**90.18%**	**Very Valid**

Student Response (Small Group)

The small group trial was conducted on Tuesday, August 10, 2021, which was tested on 6 students at SDN 192 Pekanbaru. Students use pocketbooks as teaching materials during the learning process. At this stage the teacher also observes and supervises the implementation process of the product being developed. After learning using a HOTS-based pocketbook is carried out, then students fill out a 1-4 scale questionnaire. Based on the results of the student response test, the average assessment score is 88.64%, it can be seen in table 6.

Table 6. Recapitulation of Student Responses.

No	Indicator	Score	Category
1.	Contents	90.62%	Very Valid
2.	Presentation	89.16%	Very Valid
3.	Language	83.33%	Very Valid
	Average	**88.64%**	**Very Valid**

Evaluation of Implementation Stage

After conducting a student response test, the developer evaluates that students generally like the appearance of a HOTS-based pocketbook because it has a small size, simple, colorful, concise content so that it is easy to understand heat material and its transfer, attracts students' attention because it is a HOTS-based pocketbook. have questions that stimulate students to

think critically and creatively and enable students to relate the material to life around students and can implement material to solve problems that exist around the student's environment.

DISCUSSION

This study aims to develop a pocketbook based on High Order Thinking Skills (HOTS) on heat and transfer science learning in the fifth grade of elementary school. A pocketbook is a book that is small in size, easy to carry everywhere, contains the core material, making it easier for students to understand the learning material. According to Karsono (2017:52) HOTS is a skill in solving life problems. Higher order thinking skills should be instilled in students from an early age. HOTS abilities include the ability to solve problems, the ability to think critically and creatively. HOTS has two characteristics, namely critical and creative. The HOTS-based pocketbook product that was developed can be an alternative teaching material that makes it easier for students to understand heat material and its transfer at school and outside of school.

The development of a HOTS-based pocketbook product begins with a curriculum analysis and an analysis of the needs of students. Based on this, the next researcher developed a teaching material in the form of a pocketbook containing heat material and its transfer based on HOTS. HOTS-based pocketbook teaching materials designed by researchers were carried out by examining the structure of the pocketbook preparation, in the form of making a pocketbook design framework, starting from the cover and arrangement of the contents of the pocketbook. This product design was created by researchers using the Canva application. At the development stage, the researcher began to develop a design framework and perfected the design framework then filled out each section of the pocketbook page according to the material to be arranged in a coherent manner according to the material and added other important points to the HOTS-based pocketbook so that it was suitable for printing. Furthermore, the researchers carried out the product validation stage. The stages of product validation were carried out by researchers with one educational technology validator, one media validator, and one language validator.

From the results of product assessments carried out by educational technology experts, a score of 94.83% was obtained with very valid criteria, by providing comments and suggestions for pocketbook teaching materials that were developed such as material contained in one pocketbook page, not too full. The results obtained from the material expert validator are 94.74% with very valid criteria, by providing comments and suggestions on the product to improve some materials that are considered less suitable, reducing and adding some pictures, adding questions and hypotheses to some pictures, adding the " reflect", add some examples, add conclusions and a glossary. From the results of the product assessment carried out by linguists, a score of 91.67% was obtained with very valid criteria, by providing comments and suggestions on the developed pocketbook teaching materials such as the word "think" changed to "think", and corrected some words or sentences that were lacking. appropriate.

After testing the product to the validator, the product developed is then printed and applied in the learning process to see the teacher's response and the student's response to the developed HOTS-based pocketbook. The teacher response test was conducted on four fifth grade teachers at SDN 192 Pekanbaru, each teacher will provide an assessment using the questionnaire contained in the teacher response sheet. Based on the results of the teacher's

response test, a total score of 90.18% was obtained with very feasible criteria by providing comments and suggestions on the developed pocketbook teaching materials, namely changing the background color of the pocketbook from dark to lighter.

To obtain the results of student responses, the researchers conducted 2 trials of the HOTS-based pocketbook that was developed, namely a one-on-one trial and a small group trial. One-on-one trials were conducted on 2 students and small group trials were tested on 6 fifth grade students at SDN 192 Pekanbaru. The results of the one-on-one trials obtained excellent results, the product developed was acceptable to students as a pocketbook teaching material based on High Order Thinking Skill (HOTS) heat and transfer materials. HOTS-based pocketbook teaching materials can be used independently by students by reading anywhere and anytime because the pocketbook size is small and practical to use and easy to carry everywhere. In the small group trial, the percentage was 88.64%, so it can be said that the HOTS-based pocketbook product is very feasible **.**

CONCLUSSION

HOTS-based pocketbook developed using the ADDIE development stage. Making a pocketbook using the Canva app. The HOTS-based pocketbook is said to be feasible to use after going through the product validation stage by educational technology experts, materials experts, and linguists with scores of 94.83%, 94.74% and 91.67%. The validation of educational technology provides several improvements to the developed pocketbook teaching materials, such as the material contained in one page of the pocketbook, not too full. Material experts provide comments and suggestions to improve some materials that are considered inappropriate, reduce and add some pictures, add questions and hypotheses to some pictures, add a “contemplating” section, add some examples, add conclusions and a glossary. Linguists provide comments and suggestions such as the word "think" is replaced with "think", and correct some words or sentences that are not quite right. The teacher provides comments and suggestions on the developed pocketbook teaching materials, namely changing the background color of the pocketbook from dark to lighter. Pocketbook teaching materials are categorized as pocketbooks which are very feasible in the teacher response test with a score of 90.18%. Test student responses through 2 trials, namely one-on-one trials and small group trials. The results of the one-on-one trial obtained very good results, the product developed was acceptable to students as a pocketbook teaching material based on High Order Thinking Skill (HOTS) heat and transfer materials. In the small group trial, the percentage was 88.64%, so it can be said that the HOTS-based pocketbook product is very feasible.

Based on the research that has been done, the researchers propose the following recommendations: (1) for teachers, in order to make the HOTS-based pocketbook developed by researchers as an alternative teaching material in teaching heat and its transfer material in class V SD, (2) for further research can measure the level of effectiveness in the use of HOTS-based pocketbooks for heat and transfer materials in the learning process.

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